

June 7, 1949.

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2,472,176

THROTTLE CONTROL DEVICE FOR STEAM LOCOMOTIVES

Filed April 16, 1945

3 Sheets-Sheet 1

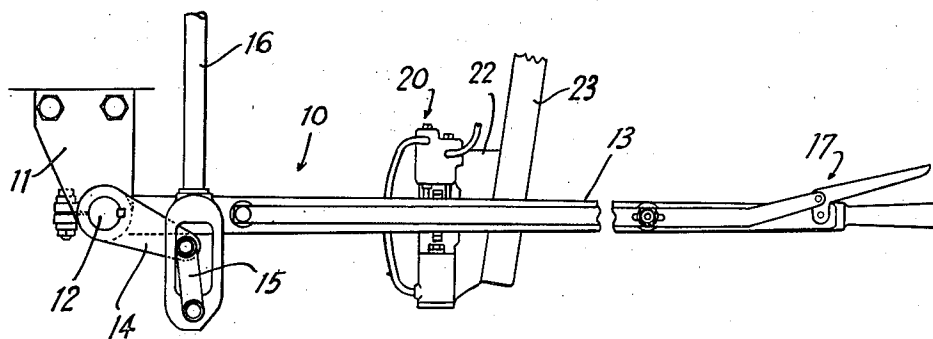
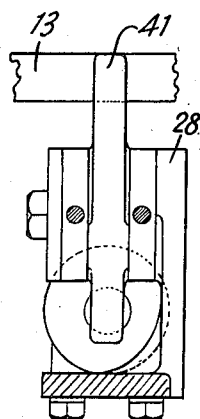
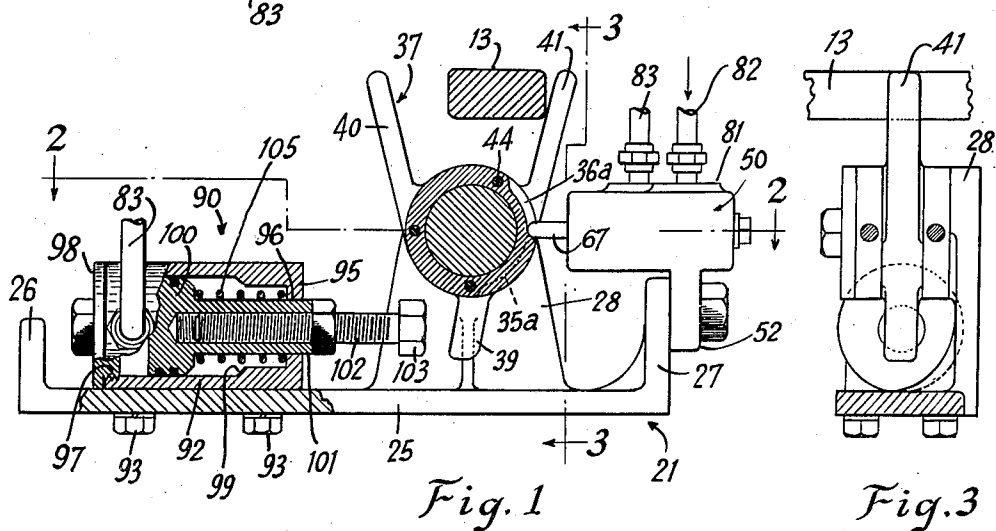
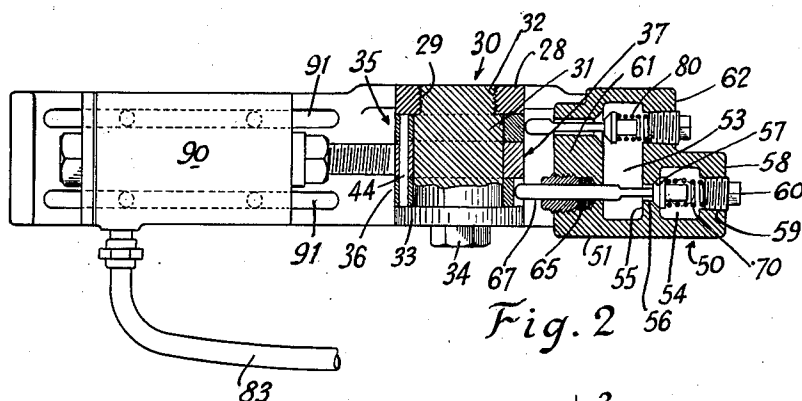


Fig. 4

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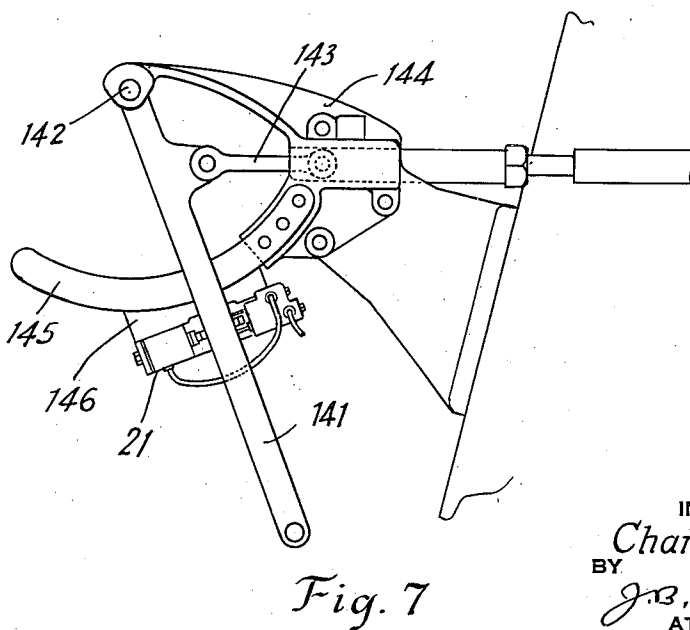
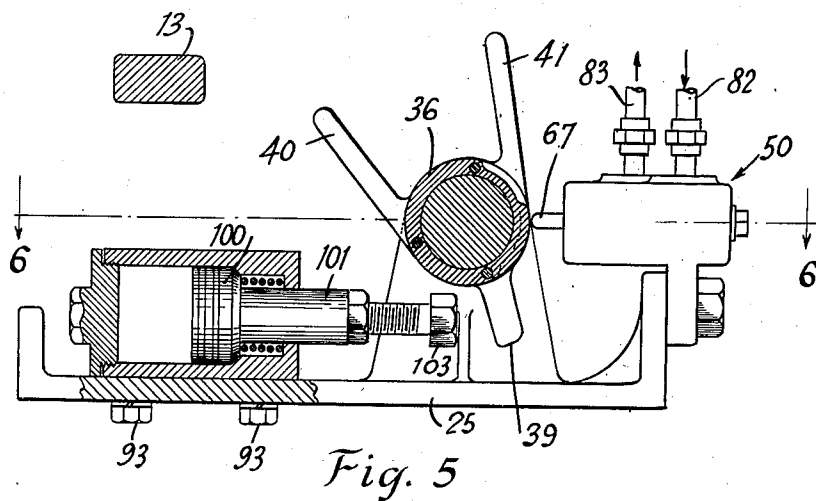
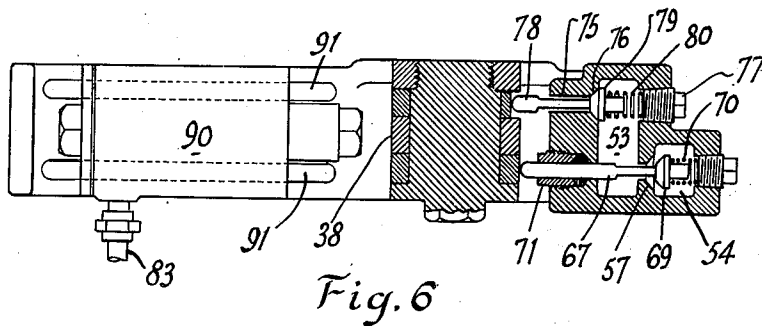
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THROTTLE CONTROL DEVICE FOR STEAM LOCOMOTIVES

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3 Sheets-Sheet 2



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THROTTLE CONTROL DEVICE FOR STEAM LOCOMOTIVES

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3 Sheets-Sheet 3

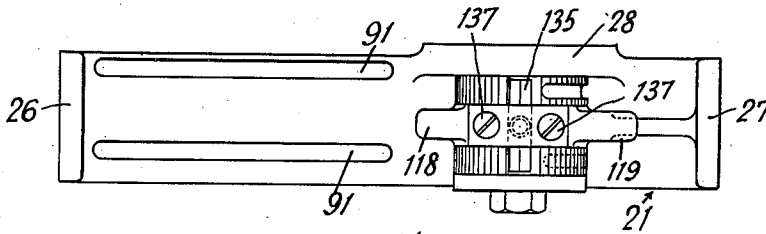


Fig. 9

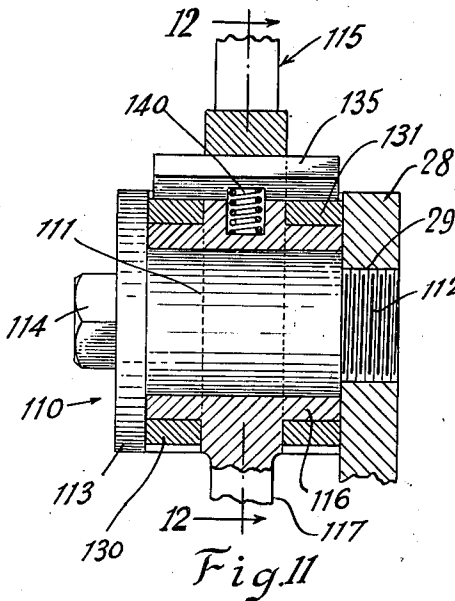


Fig. 11

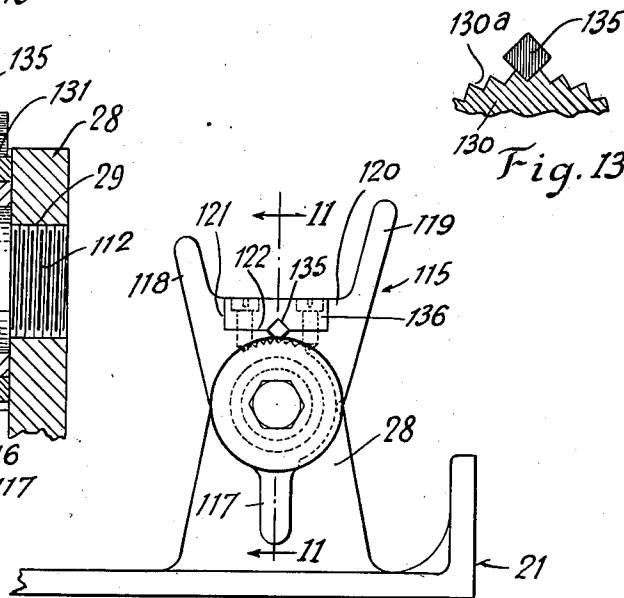


Fig. 8

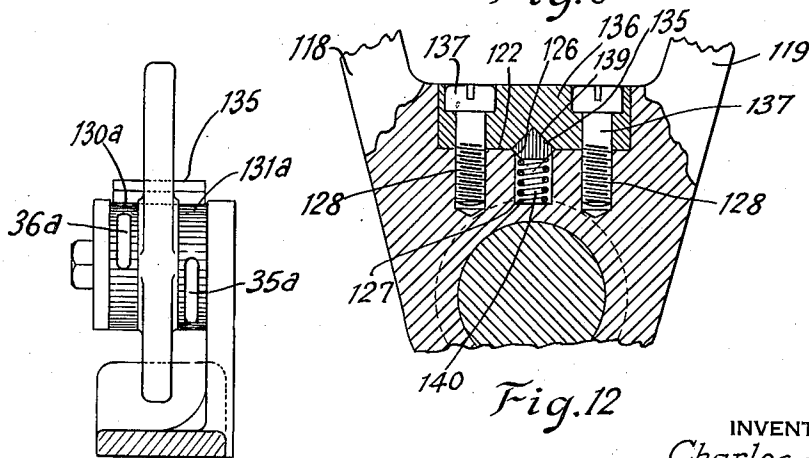


Fig. 10

Fig. 12

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THROTTLE CONTROL DEVICE FOR STEAM LOCOMOTIVES

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9 Claims. (Cl. 74—526)

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This invention relates to throttle control devices for steam locomotives.

It is well known to be desirable to permit some steam to the cylinders and valve chambers of steam locomotives when the locomotive is coasting or drifting. There is now in use drifting valves or other systems which provide for supply of some steam to the steam cylinders and valve chambers while drifting. Such devices are usually expensive and complicated, and difficult to install and maintain. Instead of using a drifting valve, the throttle could be cracked to allow a small supply of steam to enter the steam cylinders, valve chambers and superheater units. Cracking of the throttle may be accomplished by not fully closing the throttle but leaving it slightly open. Thus if the locomotive engineer when moving the throttle lever toward closing position were to stop the closing movement just before the fully closed position, some steam would get into the cylinders and valve chambers to prevent carbonization of oil and to cushion the pistons as the locomotive drifts. Many locomotive engineers either forget to crack the throttle or have difficulty in gauging the exact point where the throttle should be cracked, thereby admitting too little or too much steam. In some instances the engineers or operators will close the throttle entirely and then open it a little. This practice is bad because air and gases are sucked in through the exhaust into the cylinders and valve chambers doing the damage in the instant of closure. It is therefore an object of this invention to provide a device of the character described having means to momentarily stop the closing movement of the throttle lever just before full closing position and means to permit full closure of the throttle just after the lever is stopped. It is the stopping of the lever which reminds the engineer to hold the lever at that point to permit the locomotive to drift. After the locomotive has drifted, the lever can be fully closed to shut off all supply of steam. In fact, the lever can be shut off at any time after it is stopped, but the momentary stopping of the lever indicates to the engineer the exact point where the throttle is to be cracked, and also forcibly reminds him to crack the throttle.

Another object of this invention is to provide a device of the character described which may be applied either to a horizontal throttle lever or a vertical throttle lever, and means being further provided to adjust the point at which the lever is momentarily stopped.

Another object of this invention is to provide

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a device of the character described automatically controlled by air pressure which is available in locomotives.

Yet a further object of this invention is to provide a strong and durable device of the character described which shall be relatively inexpensive to manufacture, easy to install on a locomotive, which shall be smooth and positive in operation, and yet practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of application will be indicated in the following claims.

In the accompanying drawing, in which is shown one of the various possible illustrative embodiments of this invention,

Fig. 1 is a front elevational view of a device embodying the invention with parts broken away and in cross-section;

Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is a top plan view showing the application of the control to a horizontal throttle lever assembly;

Fig. 5 is a view similar to Fig. 1 but showing the parts in the position when the throttle is open;

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 5;

Fig. 7 is an elevational view showing the device applied to a vertical throttle lever assembly;

Fig. 8 is a partial side elevational view illustrating a modified construction;

Fig. 9 is a top plan view of the structure shown in Fig. 8;

Fig. 10 is a side elevational view of the structure shown in Fig. 8;

Fig. 11 is an enlarged cross-sectional view taken on line 11—11 of Fig. 8;

Fig. 12 is a cross-sectional view taken on line 12—12 of Fig. 11; and

Fig. 13 is a partial, vertical cross-sectional view illustrating the adjusting means.

Referring now in detail to the drawing, 10 designates a horizontal throttle lever assembly for a locomotive. The same comprises a bracket 11 carrying a vertical pivot pin 12. Fixed to pivot pin 12 is a throttle lever 13. There is also

fixed to pivot pin 12, an arm 14 connected by link 15 to a rod 16 connected to the throttle. Lever 13 is provided with a usual ratchet release mechanism 17. Upon swinging lever 13 in a clockwise direction, looking at Fig. 4, the rod 16 is pulled to open the throttle. When lever 13 is returned toward its normal position by swinging the same in a counterclockwise direction, rod 16 closes the throttle.

In accordance with the present invention there is provided a device 20 to momentarily stop the lever 13 just before it is fully closed so that the engineer may stop further movement of the lever to permit some steam to pass from the throttle to the steam cylinders, valve chambers and superheater units, while the train is drifting into the station or at any other point. The device 20 comprises a bracket 21 which may be attached to an arm 22 fixed to the usual guide arm 23 which supports the lever 13. Obviously the bracket 21 may be fixed to any suitable support on the locomotive. The position of the bracket 21 relative to the lever arm 13 is illustrated in Fig. 4 of the drawing and will be explained hereinafter.

Bracket 21 comprises a bottom wall 25 having an upstanding wall 26 at one end, and an upstanding wall 27 at its other end. At one side of bottom wall 25 is an upstanding ear 28. The ear 28 is formed with a screw threaded opening 29. Screwed thereto is a shaft 30. Shaft 30 comprises a cylindrical portion 31 having a reduced screw threaded portion 32 at one end screwed within the opening 29. At the opposite end of cylindrical portion 31 is an enlarged flange 33. The shaft 30 is also formed with a hexagonal head 34 to facilitate rotation of the shaft with a wrench.

Mounted on the cylindrical portion 31 of shaft 30 are a pair of annular cam rings 35 and 36 and a fork 37 interposed therebetween. The fork 37 has a central annular portion 38 journaled on shaft portion 31, a downwardly extending arm 39 and a pair of upwardly diverging fingers 40, 41. It will be noted that when the throttle lever 13 is closed, the lever is disposed between the fingers 40, 41 and in contact with finger 41. When the throttle lever is moved to open position as shown in Fig. 5, lever 13 will contact finger 40 to rotate the fork in a clockwise direction to the position shown in Fig. 5, thereby permitting the lever to move beyond finger 40. As the lever 13 is again moved toward closing position it will pass finger 40 and engage finger 41 to rotate the fork in a clockwise direction. The annular cam rings 35, 36 as well as annular portion of the fork are formed with aligned through openings to receive pins 44 to attach the cam rings to the fork. Cam ring 36 is formed in its outer surface with a cam groove 36a; whereas the cam ring 35 is formed at its outer surface with a cam groove 35a, for the purpose hereinafter appearing. The grooves 35a, 36a are offset from each other as shown in the drawing. The cam ring 36 is an intake cam and cam ring 35 is an exhaust cam.

Fixed to wall 27 is a valve 50. Valve 50 comprises a body 51 formed with a flange 52 contacting wall 27 and bolted thereto. Body 51 is furthermore formed with a transverse chamber 53 and with a smaller chamber 54 aligned with one end of chamber 53. Between chambers 53, 54 is a wall 55 formed with a through opening 56. At opening 56 is a valve seat 57 facing towards chamber 54. The body 51 is formed with an end wall 58 forming one end for chamber 54. The

end wall 58 is formed with a screw threaded opening 59 to receive a plug 60. The body is furthermore formed with an end wall 61 forming one end of chamber 53 and with an end wall 62 aligned with wall 55. Walls 55, 62 form a wall for chamber 53 opposite to wall 61. Wall 61 is formed with a through opening 65 aligned with opening 56. Extending through openings 55 and 56 is a valve pin 67. Valve pin 67 is formed with a head 69 adapted to be seated on the seat 57. Interposed between the head 69 and plug 60 is a spring 70 normally urging the head 69 into seated position on the seat 57. In opening 65 is a stuffing box gland 71. The forward end of pin 67 contacts intake cam 36. When the throttle lever 13 is pulled to open the throttle, pin 67 rides on cam 36 to open the passage 56.

Wall 61 is formed with a through opening 75 having a valve seat 76 facing towards chamber 53. Wall 62 is formed with a screw threaded opening closed by a screw plug 77. Extending through the opening 75 is a valve pin 78 formed with a valve seat portion 79 adapted to be seated on the valve seat 76. Interposed between the head 79 and the plug 77 is an annular compressed spring 80 which normally urges the pin 78 towards seated position. When the valve 67 is open, pin 78 rides in the groove 35a of the exhaust cam 35 and is closed by spring 80.

The top wall 81 of the valve body 51 is formed with an opening communicating with chamber 54 to which is connected a pipe or conduit 82. Said wall is furthermore formed with an opening communicating with chamber 53 to which is attached a pipe or conduit 83. Air under pressure is supplied to pipe 82. When the valve 67 is closed as shown in Fig. 2, no air under pressure can pass to chamber 53. However, when the valve 67 is open, air under pressure passes from chamber 54 through opening 56 to chamber 53. When the valve 78 is open, air pressure in chamber 53 dissipates through opening 75 to the atmosphere.

As the throttle lever 13 is moved to the right towards closing position, it will engage finger 41 to rotate the fork and the cam rings clockwise, thereby permitting spring 70 to close valve pin 67 and open valve pin 78. Such position is shown in Fig. 2 of the drawing.

For the purpose hereinafter appearing, there is mounted on the bottom wall 25 of bracket 21, a cylinder 90. The bottom wall 25 may be formed with a pair of longitudinal slots 91. Cylinder 90 has a flat bottom surface 92 formed with threaded openings to receive studs 93 projecting through the opening 91. The cylinder 90 may thus be adjusted longitudinally of the bracket. Said cylinder 90 has an end wall 95 at one end formed with a through opening 96. At the other end of the cylinder 90 is a screw threaded opening 97. Screwed thereto is a plug or cover 98. The pipe 83 is connected to the cylinder 90 and communicates with the interior thereof adjacent its end 98. Within the cylinder is an internal shoulder 99. Slidably mounted within the cylinder is a piston 100 provided with a piston rod 101 projecting through the opening 96. The piston rod 101 is formed with an internal screw threaded opening in which is screwed an adjusting stud 102. The stud 102 has a head 103 adapted to engage the finger or arm 39 of the fork. Within the cylinder and surrounding the piston rod 101 is a coil compression spring 105 which urges the piston to the left, as shown in Fig. 1 of the drawing.

The operation of the device will now be described. The fork 37 and lever 13 are normally in the position shown in Fig. 1. In such position, valve pin 67 is closed, and valve pin 78 is open. Thus the spring 105 moves the piston to the left as the pressure from the cylinder 90 is exhausted through conduit 83, chamber 53, and passage 75. Pressure from conduit 82 passes to chamber 54 but since valve pin 67 is closed, air under pressure cannot pass to chamber 53. When the lever is moved to open the throttle, the fork moves to the position shown in Fig. 5 thereby opening valve pin 67 and closing valve pin 78. Air under pressure then passes to chamber 53, through conduit 83, to the cylinder 90 to move the piston 100 to the right against the pressure of spring 105. When the lever 13 is again moved toward closing position, it will engage finger 41 to rotate the fork in a clockwise direction, but before the throttle is fully closed, finger 39 strikes the stud 103 which momentarily stops further movement of the lever. In this position, however, valve pin 67 closes, and valve pin 78 opens so that the supply of pressure to the cylinder is shut, and the compressed air therein escapes through conduit 83 and passage 75 thereby permitting the spring 105 to move the piston 100 to the left. The throttle lever may then be moved further toward fully closing position at any time after it is stopped.

In Figs. 8 to 12 there is shown a modified form of the fork and cams. In said fingers, bracket 21 is illustrated, and the same is shown provided with an upstanding ear 28 formed with a screw threaded opening 29. Screwed thereto is a shaft 110. The shaft 110 has a cylinder portion 111 and a reduced threaded portion 112 engaging the screw threaded opening 29 of ear 28. At the opposite end of the cylinder portion 111 is an enlarged flange 113 formed with a polygonal knob or head 114. Rotatably mounted on the cylindrical portion 111 is a fork 115. said fork comprises a sleeve 116 rotatably mounted on the shaft portion 111. The sleeve 116 extends from the flange 113 to ear 28. Integrally formed with said sleeve is a downwardly projecting finger 117 disposed centrally of the sleeve. There also extends upwardly from the central portion of the sleeve, a pair of diverging fingers 118 and 119. The finger 119 may extend upwardly above finger 118. Between the fingers 118 and 119 is a web portion 120 formed with a rectangular recess or slot 121. The slot 121 has a bottom wall or surface 122. Said bottom wall 122 is formed with a transverse angular groove 126. The web is furthermore formed with a central blind opening 127 communicating with the midportion of the groove 126, for the purpose hereinafter appearing. Said bottom surface 122 is furthermore formed on opposite sides of the opening 127 with a pair of parallel screw threaded openings 128. Rotatably mounted on sleeve 116 and on opposite sides of the fingers is a pair of cams 130, 131. Cam 130 is an intake cam, whereas cam 131 is an exhaust cam. They are formed with grooves similar to grooves 36a, 35a of the cams 36, 35. Said cams are furthermore formed at part of their outer surfaces, with ratchet teeth 130a, 131a, respectively. Mounted in the groove 126 is a pawl 135 adapted to engage the teeth of the cams 130, 131.

Within the recess or slot 121 is a block 136 attached to the fork by screws 137 engaging the threads of the openings 128. The block 136 is

formed with an angular transverse groove 139 to receive the pawl 135. Within the opening 127 is a coil compression spring 140 contacting the underside of the pawl 135. Said pawl may be formed with a central flat to be engaged by the spring 140. The position of the cams may be adjusted by loosening screws 137 to permit lifting of pawl 135 and block 136 by spring 140. After the cams are rotated to the desired angle, the screws may again be tightened so that the pawl may engage the teeth of said cams. The position of the cam grooves 36a, 35a may thus be properly adjusted.

In Fig. 7 there is shown a vertical type throttle lever assembly well known in the art. This assembly includes a lever 141 pivoted as at 142. Connected to the lever is a rod 143 which is connected to the throttle. Fixed to the bracket 144 is an arcuate plate 145 and attached thereto is a bracket 146 to which the bracket 21 may be fixed in the position shown in Fig. 7 with the lever 141 between the fingers of the fork.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In combination, a rotatably mounted fork having a pair of diverging fingers, an arm on said fork, a cylinder, a piston within the cylinder, means on the piston to engage said arm, means to supply compressed air to one end of the cylinder to move the piston in one direction to a predetermined position in the path of movement of said arm, spring means to urge the piston in an opposite direction, and means actuated by the fork to control the supply of compressed air to the cylinder.

2. In combination, a rotatably mounted fork having a pair of diverging fingers, an arm on said fork, a cylinder, a piston within the cylinder, means on the piston to engage said arm, means to supply compressed air to one end of the cylinder to move the piston in one direction to a predetermined position in the path of movement of said arm, spring means to urge the piston in an opposite direction, and means actuated by the fork to control the supply of compressed air to the cylinder, and means actuated by said fork to permit the exhaust of compressed air from said cylinder.

3. In combination, a bracket, a shaft on the bracket, a fork rotatably mounted on the shaft, said fork having a pair of diverging fingers, and an arm, a cylinder on said bracket, a piston in the cylinder, means on the piston to engage said arm, an air valve on said bracket, said air valve comprising a pair of chambers, means to supply compressed air to one chamber, a conduit connecting one end of the cylinder to the other chamber, a valve pin controlling the passage of air from the first chamber to the second chamber, a valve pin controlling the exhaust of air from said second chamber, and means on said fork to control said valve pins.

4. In combination, a bracket, a shaft on the bracket, a fork rotatably mounted on the shaft,

said fork having a pair of diverging fingers, and an arm, a cylinder on said bracket, a piston in the cylinder, means on the piston to engage said arm, an air valve on said bracket, said air valve comprising a pair of chambers, means to supply compressed air to one chamber, a conduit connecting one end of the cylinder to the other chamber, a valve pin controlling the passage of air from the first chamber to the second chamber, a valve pin controlling the exhaust of air from said second chamber, means on said fork to control said valve pins, and means to adjust the positions of said controlling means relative to said fork.

5. In a combination, a bracket having an ear, a shaft mounted on the ear, a fork comprising a sleeve rotatably mounted on the shaft, a pair of diverging fingers projecting upwardly from said sleeve, an arm projecting downwardly from the sleeve, a pair of cam rings rotatably mounted on the sleeve, means to fix said cam rings to said sleeve in various adjusted positions, means to engage said arm, and means controlled by said cam rings to release said engaging means.

6. In combination with the throttle lever of a steam locomotive, a member adapted to engage opposite sides of the lever, and to be moved in one direction upon moving the lever towards one position, and in an opposite direction upon moving the throttle lever to a second position, means to abut said member when it is moved by the lever as said lever is moved toward said first position, at a point just short of said first position, compressed air means to retain the abutting means in abutting position, means controlled by said member to supply compressed air to the compressed air means, and further to shut off supply of compressed air to said compressed air means.

7. In combination with the throttle lever of a steam locomotive, a member adapted to engage opposite sides of the lever, and to be moved in one direction upon moving the lever towards one position, and in an opposite direction upon moving the throttle lever to a second position, means to abut said member when it is moved by the lever

as said lever is moved toward said first position, at a point just short of said first position, compressed air means to retain the abutting means in abutting position, means controlled by said member to supply compressed air to the compressed air means, and further to shut off supply of compressed air to said compressed air means, and means controlled by said member to exhaust air under pressure from said compressed air means.

8. In combination with a throttle lever of a steam locomotive, means for stopping the lever, as the lever is moved towards one position, at a point somewhat short of said position, and means controlled by the stopping means to automatically release said stopping means to permit the lever to be thereafter moved to said position, and means to regulate the stopping point for said lever.

9. In combination with a movable member, means for stopping said member, as the member is moved towards one position, at a point somewhat short of said position, and means controlled by the stopping means to automatically release said stopping means to permit the member to be thereafter moved to said position, and means to regulate the stopping point for said member.

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